

What is claimed is:

1. An electrophotographic photoconductor, comprising:
an electroconductive substrate; and
a photoconductive layer on or above the electroconductive substrate, the photoconductive layer comprising:
a cross-linked surface layer which comprises:
a cured tri- or more-functional radical polymerizable monomer without having a charge transporting structure; and
a cured mono-functional radical polymerizable compound having a charge transporting structure,
wherein the cross-linked surface layer has an elastic displacement rate ϵ of 35% or more and a standard deviation of the elastic displacement rate ϵ of 2% or less.

2. An electrophotographic photoconductor according to Claim 1, wherein the cured tri- or more-functional radical polymerizable monomer without having a charge transporting structure has a functional group selected from the group consisting of an acryloyloxy group and a methacryloyloxy group.

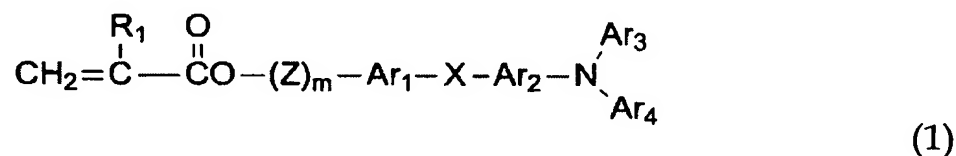
3. An electrophotographic photoconductor according to Claim 1, wherein the cured tri- or more-functional radical polymerizable monomer without having a charge transporting structure has a ratio (molecular weight/number of functional

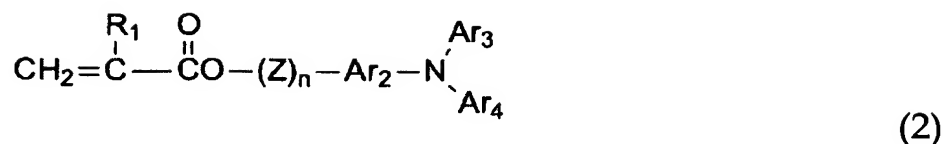
group) of molecular weight to the number of functional group of 250 or less.

4. An electrophotographic photoconductor according to Claim 1, wherein the cured mono-functional radical polymerizable compound having a charge transporting structure has a functional group selected from the group consisting of an acryloyloxy group and a methacryloyloxy group.

5. An electrophotographic photoconductor according to Claim 1, wherein the charge transporting structure of the cured mono-functional radical polymerizable compound having a charge transporting structure is a triarylamine structure.

6. An electrophotographic photoconductor according to Claim 1, wherein the cured mono-functional radical polymerizable compound having a charge transporting structure is represented by one of the formulae (1) and (2):





wherein, R₁ represents a hydrogen atom, a halogen atom, an alkyl group which may be substituted, an aralkyl group which may be substituted, an aryl group which may be substituted, a cyano group, a nitro group, an alkoxy group, -COOR₇ (R₇ represents a hydrogen atom, an alkyl group which may be substituted, an aralkyl group which may be substituted or an aryl group which may be substituted), a halogenated carbonyl group or CONR₈R₉ (R₈ and R₉ represent a hydrogen atom, a halogen atom, an alkyl group which may be substituted, an aralkyl group which may be substituted or an aryl group which may be substituted, which may be identical or different);

Ar₁ and Ar₂ represent a substituted or unsubstituted arylene group, which may be identical or different;

Ar₃ and Ar₄ represent a substituted or unsubstituted aryl group, which may be identical or different;

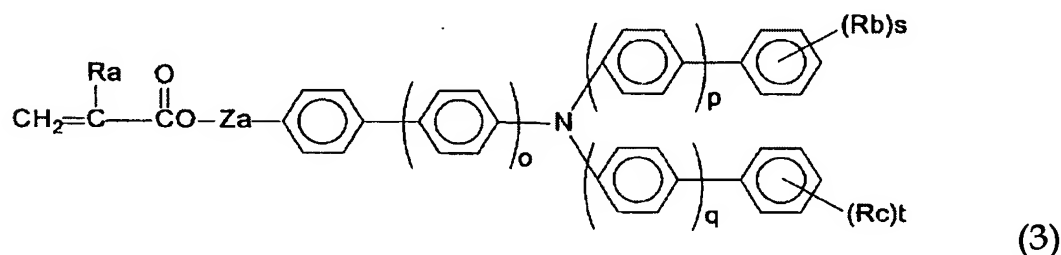
X represents a single bond, a substituted or unsubstituted alkylene group, a substituted or unsubstituted cycloalkylene group, a substituted or unsubstituted alkylene ether group, a oxygen atom, a sulfur atom or a vinylene group;

Z represents a substituted or unsubstituted alkylene group, a substituted or unsubstituted alkylene ether group or an

alkyleneoxycarbonyl group; and

"m" and "n" represent an integer of 0 to 3.

7. An electrophotographic photoconductor according to Claim 1, wherein the cured mono-functional radical polymerizable compound having a charge transporting structure is represented by the following formula (3):



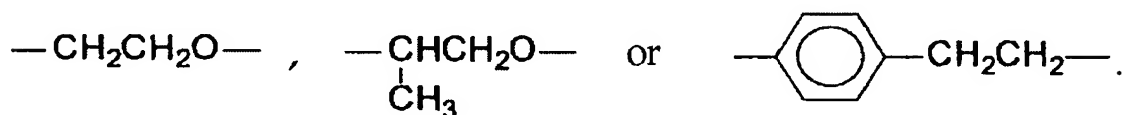
wherein, "o," "p" and "q" each represent an integer of 0 or 1;

Ra represents a hydrogen atom or a methyl group;

Rb and Rc represent an alkyl group having 1 to 6 carbon atoms, wherein each of Rb and Rc may be different when there are two or more Rb and Rc, respectively;

"s" and "t" represent an integer of 0 to 3; and

Za represents a single bond, a methylene group, an ethylene group,



8. An electrophotographic photoconductor according to Claim 1, wherein the cured tri- or more-functional radical polymerizable monomer without having a charge transporting structure is 30% to 70% by weight, based on the total amount of the cross-linked surface layer.

9. An electrophotographic photoconductor according to Claim 1, wherein the cured mono-functional radical polymerizable compound having a charge transporting structure is 30% to 70% by weight, based on the total amount of the cross-linked surface layer.

10. An electrophotographic photoconductor according to Claim 1, wherein the photoconductive layer comprises:
a charge generation layer;
a charge transport layer; and
the cross-linked surface layer laminated on or above the electroconductive substrate in this order.

11. An electrophotographic photoconductor according to Claim 10, wherein the charge transport layer comprises a polymer charge transport material.

12. An electrophotographic photoconductor according to

Claim 11, wherein the polymer charge transport material is a polycarbonate having a triarylamine structure in the main chain or side chain thereof.

13. An electrophotographic photoconductor according to Claim 1, wherein the cross-linked surface layer is cured by one of heating and light irradiation.

14. An electrophotographic photoconductor according to Claim 10, wherein the cross-linked surface layer has a thickness of from 1 μm to 10 μm .

15. An electrophotographic photoconductor according to Claim 10, wherein the thickness is from 2 μm to 8 μm .

16. An electrophotographic photoconductor according to Claim 10, wherein the cross-linked surface layer is insoluble in an organic solvent.

17. An electrophotographic photoconductor, comprising:
an electroconductive substrate;
a charge generation layer;
a charge transport layer; and
a cross-linked surface layer, the layers sequentially laminated on the electroconductive substrate,

wherein the cross-linked surface layer comprises:

a cross-linked and cured tri- or more-functional radical polymerizable monomer without having a charge transporting structure; and

a cross-linked and cured mono-functional radical polymerizable compound having a charge transporting structure,

wherein the cross-linked surface layer has thickness of from 1 μm to 10 μm .

18. An electrophotographic photoconductor according to Claim 17, wherein the thickness is from 2 μm to 8 μm .

19. An electrophotographic photoconductor according to Claim 17, wherein the cross-linked surface layer is insoluble in an organic solvent.

20. An electrophotographic photoconductor according to Claim 17, wherein the cross-linked and cured tri- or more-functional radical polymerizable monomer without having a charge transporting structure has a functional group selected from the group consisting of an acryloyloxy group and a methacryloyloxy group.

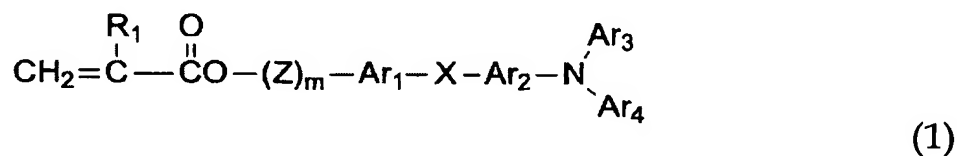
21. An electrophotographic photoconductor according to Claim 17, wherein the cross-linked and cured tri- or more-functional

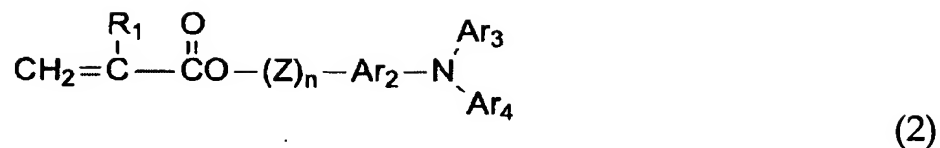
radical polymerizable monomer without having a charge transporting structure has a ratio (molecular weight/number of functional group) of molecular weight to the number of functional group of 250 or less.

22. An electrophotographic photoconductor according to Claim 17, wherein the cross-linked and cured mono-functional radical polymerizable compound having a charge transporting structure has a functional group selected from the group consisting of an acryloyloxy group and a methacryloyloxy group.

23. An electrophotographic photoconductor according to Claim 17, wherein the charge transporting structure of the cross-linked and cured mono-functional radical polymerizable compound having a charge transporting structure is a triarylamine structure.

24. An electrophotographic photoconductor according to Claim 17, wherein the cross-linked and cured mono-functional radical polymerizable compound having a charge transporting structure is represented by one of the formulae (1) and (2):





wherein, R₁ represents a hydrogen atom, a halogen atom, an alkyl group which may be substituted, an aralkyl group which may be substituted, an aryl group which may be substituted, a cyano group, a nitro group, an alkoxy group, -COOR₇ (R₇ represents a hydrogen atom, an alkyl group which may be substituted, an aralkyl group which may be substituted or an aryl group which may be substituted), a halogenated carbonyl group or CONR₈R₉ (R₈ and R₉ represent a hydrogen atom, a halogen atom, an alkyl group which may be substituted, an aralkyl group which may be substituted or an aryl group which may be substituted, which may be identical or different);

Ar₁ and Ar₂ represent a substituted or unsubstituted arylene group, which may be identical or different;

Ar₃ and Ar₄ represent a substituted or unsubstituted aryl group, which may be identical or different;

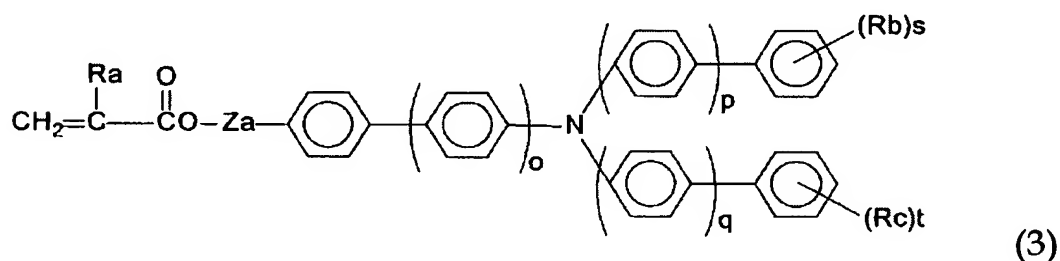
X represents a single bond, a substituted or unsubstituted alkylene group, a substituted or unsubstituted cycloalkylene group, a substituted or unsubstituted alkylene ether group, a oxygen atom, a sulfur atom or a vinylene group;

Z represents a substituted or unsubstituted alkylene group, a substituted or unsubstituted alkylene ether group or an

alkyleneoxycarbonyl group; and

"m" and "n" represent an integer of 0 to 3.

25. An electrophotographic photoconductor according to Claim 17, wherein the cross-linked and cured mono-functional radical polymerizable compound having a charge transporting structure is represented by the following formula (3):



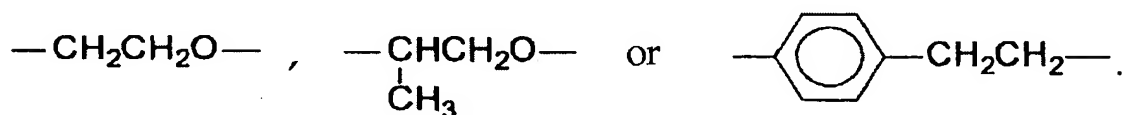
wherein, "o," "p" and "q" each represent an integer of 0 or 1;

Ra represents a hydrogen atom, a methyl group;

Rb and Rc represent an alkyl group having 1 to 6 carbon atoms, wherein each of Rb and Rc may be different when there are two or more Rb and Rc, respectively;

"s" and "t" represent an integer of 0 to 3; and

Za represents a single bond, a methylene group, an ethylene group,



26. An electrophotographic photoconductor according to Claim 17, wherein the cross-linked and cured tri- or more-functional radical polymerizable monomer without having a charge transporting structure is 30% to 70% by weight, based on the total amount of the cross-linked surface layer.

27. An electrophotographic photoconductor according to Claim 17, wherein the cross-linked and cured mono-functional radical polymerizable compound having a charge transporting structure is 30% to 70% by weight, based on the total amount of the cross-linked surface layer.

28. An electrophotographic photoconductor according to Claim 17, wherein the charge transport layer comprises a polymer charge transport material.

29. An electrophotographic photoconductor according to Claim 28, wherein the polymer charge transport material is a polycarbonate having a triarylamine structure in the main chain or side chain thereof.

30. An electrophotographic photoconductor according to Claim 17, wherein the cross-linked surface layer is cured by one of heating and light irradiation.

31. An electrophotographic photoconductor according to Claim 17, wherein the cross-linked surface layer has an elastic displacement rate τ_e of 35% or more and a standard deviation of the elastic displacement rate τ_e of 2% or less.

32. A process for forming an image, comprising:
charging an electrophotographic photoconductor;
exposing the electrophotographic photoconductor which is charged to a recording light so as to form an electrostatic latent image;

developing the electrostatic latent image by a developing agent so as to visualize the electrostatic latent image and form a toner image; and

transferring the toner image formed by developing onto a transfer material,

wherein the electrophotographic photoconductor comprises:
an electroconductive substrate; and

a photoconductive layer on or above the electroconductive substrate, the photoconductive layer comprising:

a cross-linked surface layer which comprises:

a cured tri- or more-functional radical polymerizable monomer without having a charge transporting structure; and

a cured mono-functional radical polymerizable compound having a charge transporting structure,

wherein the cross-linked surface layer has an elastic displacement rate τ_e of 35% or more and a standard deviation of the elastic displacement rate τ_e of 2% or less.

33. A process for forming an image, comprising:
- charging an electrophotographic photoconductor;
 - exposing the electrophotographic photoconductor which is charged to a recording light so as to form an electrostatic latent image;
 - developing the electrostatic latent image by a developing agent so as to visualize the electrostatic latent image and form a toner image; and
 - transferring the toner image formed by developing onto a transfer material,
- wherein the electrophotographic photoconductor comprises:
- an electroconductive substrate;
 - a charge generation layer;
 - a charge transport layer; and
 - a cross-linked surface layer, the layers sequentially laminated on the electroconductive substrate,
- wherein the cross-linked surface layer comprises:
- a cross-linked and cured tri- or more-functional radical polymerizable monomer without having a charge transporting structure; and
 - a cross-linked and cured mono-functional radical

polymerizable compound having a charge transporting structure,
wherein the cross-linked surface layer has thickness of from 1
 μm to 10 μm .

34. An apparatus for forming an image, comprising:
an electrophotographic photoconductor;
a charger to charge the electrophotographic photoconductor;
an exposer to expose the electrophotographic
photoconductor charged by the charger to a recording light to form
an electrostatic latent image;

a developing unit to supply a developing agent to the
electrostatic latent image to visualize the electrostatic latent image
and form a toner image; and

a transferring unit to transfer the toner image formed by the
developing unit on a transfer material,

wherein the electrophotographic photoconductor comprises:
an electroconductive substrate; and

a photoconductive layer on or above the electroconductive
substrate, the photoconductive layer comprising:

a cross-linked surface layer which comprises:

a cured tri- or more-functional radical polymerizable
monomer without having a charge transporting structure; and

a cured mono-functional radical polymerizable
compound having a charge transporting structure,

wherein the cross-linked surface layer has an elastic

displacement rate τ_e of 35% or more and a standard deviation of the elastic displacement rate τ_e of 2% or less.

35. An apparatus for forming an image, comprising:
- an electrophotographic photoconductor;
 - a charger to charge the electrophotographic photoconductor;
 - an exposer to expose the electrophotographic photoconductor charged by the charger to a recording light to form an electrostatic latent image;
 - a developing unit to supply a developing agent to the electrostatic latent image to visualize the electrostatic latent image and form a toner image; and
 - a transferring unit to transfer the toner image formed by the developing unit on a transfer material,
- wherein the electrophotographic photoconductor comprises:
- an electroconductive substrate;
 - a charge generation layer;
 - a charge transport layer; and
 - a cross-linked surface layer, the layers sequentially laminated on the electroconductive substrate,
- wherein the cross-linked surface layer comprises:
- a cross-linked and cured tri- or more-functional radical polymerizable monomer without having a charge transporting structure; and
 - a cross-linked and cured mono-functional radical

polymerizable compound having a charge transporting structure,
wherein the cross-linked surface layer has thickness of from 1
 μm to 10 μm .

36. A process cartridge for an image forming apparatus,
comprising:

an electrophotographic photoconductor; and

at least one selected from the group consisting of:

a charger to charge the electrophotographic
photoconductor;

a developing unit to supply a developing agent to an
electrostatic latent image formed by exposure on the
electrophotographic photoconductor to visualize the electrostatic
latent image and form a toner image;

a transferring unit to transfer the toner image formed
by the developing unit on a transfer material;

a cleaning unit to remove toner remaining on the
electrophotographic photoconductor after transferring; and

a discharging unit to remove the latent image on the
photoconductor after transferring so as to form a monolithic
structure,

wherein the process cartridge is adapted to be attached to
and detached from a main body of the image forming apparatus,
and

the electrophotographic photoconductor comprises:

an electroconductive substrate; and
a photoconductive layer on or above the electroconductive substrate, the photoconductive layer comprising:
a cross-linked surface layer which comprises:
a cured tri- or more-functional radical polymerizable monomer without having a charge transporting structure; and
a cured mono-functional radical polymerizable compound having a charge transporting structure,
wherein the cross-linked surface layer has an elastic displacement rate ϵ of 35% or more and a standard deviation of the elastic displacement rate ϵ of 2% or less.

37. A process cartridge for an image forming apparatus, comprising:
an electrophotographic photoconductor; and
at least one selected from the group consisting of:
a charger to charge the electrophotographic photoconductor;
a developing unit to supply a developing agent to an electrostatic latent image formed by exposure on the electrophotographic photoconductor to visualize the electrostatic latent image and form a toner image;
a transferring unit to transfer the toner image formed by the developing unit on a transfer material;
a cleaning unit to remove toner remaining on the

electrophotographic photoconductor after transferring; and
a discharging unit to remove the latent image on the photoconductor after transferring so as to form a monolithic structure,
wherein the process cartridge is adapted to be attached to and detached from a main body of the image forming apparatus, and
the electrophotographic photoconductor comprises:
an electroconductive substrate;
a charge generation layer;
a charge transport layer; and
a cross-linked surface layer, the layers sequentially laminated on the electroconductive substrate,
wherein the cross-linked surface layer comprises:
a cross-linked and cured tri- or more-functional radical polymerizable monomer without having a charge transporting structure; and
a cross-linked and cured mono-functional radical polymerizable compound having a charge transporting structure,
wherein the cross-linked surface layer has thickness of from 1 μm to 10 μm .